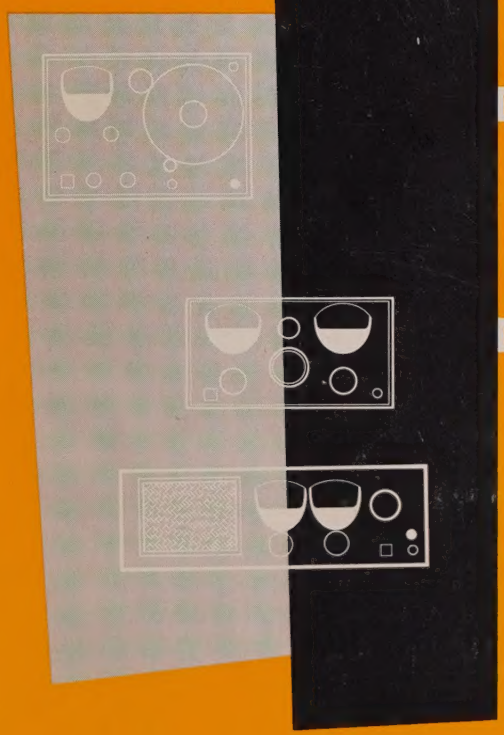
1340

10.7 MHz

INSTRUCTION MANUAL

PLUG-IN UNIT
TYPE 1340
10.7 MHz

SERIAL NO. 101

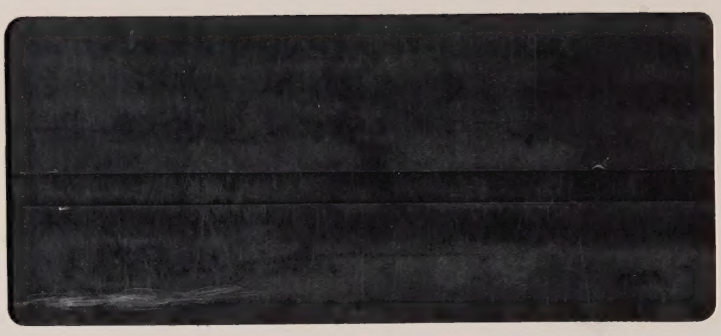


• ELECTRONIC INSTRUMENTS

Quan-Tech

LABORATORIES INC.

WHIPPANY, N. J.



INSTRUCTION MANUAL

PLUG-IN UNIT
TYPE 1340
10.7 MHz

SERIAL NO. 101

MR STOVER

QUAN-TECH LABORATORIES, INC.

43 So. Jefferson Road Whippany, New Jersey 07981

201-887-5508

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_06430

CLAIM FOR DAMAGE IN SHIPMENT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

WARRANTY

Quan-Tech Laboratories, Inc. warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. Electronic tubes and batteries are specifically excluded from any liability. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination it is disclosed to our satisfaction to be defective. If the fault has been caused by misadjustments, misuse, or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

Calibration checks of this instrument can easily be made in accordance with the instruction manual. Routine readjustments should never be attempted. If, however, the instrument has been damaged and requires recalibration or alignment, explicit calibration procedures as defined in the instruction manual must be followed.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty, and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.

2. On receipt of shipping instructions, forward the instrument prepaid, to the factory. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

SHIPPING

The instruments should be packed in their original containers, or in a strong exterior container and surrounded by two inches of shock absorbing material.

Quan-Tech LABORATORIES

43 SOUTH JEFFERSON ROAD WHIPPANY, NEW JERSEY 07981

201-887-5508

TABLE OF CONTENTS

SECTION		PAGE
1.	GENERAL	
	A. Description	1 - 1
	B. Specifications	1 - 1
2.	OPERATING INSTRUCTIONS	
	A. Operation	2 - 1
3.	THEORY OF OPERATION	
	A. General	3 - 1
	B. Test Transistor Circuitry	3 - 1
	C. 10.7 MHz Amplifiers	3 - 2
	D. 10.720 MHz Calibrate Signal	3 - 2
	E. 10.700 MHz Local Oscillator Signal	3 - 3
	F. Mixer and Low Pass Filter	3 - 3
	G. Noise Fundamentals	3 - 3
4.	MAINTENANCE AND CALIBRATION	
	A. General	4 - 1
	B. Accessibility of Adjustments	4 - 1
	C. Calibration	4 - 1

LIST OF ILLUSTRATIONS AT REAR OF MANUAL

Location and Identification of Adjustments

Typical Bandpass Response

Typical AGC Gain Plot

Typical Low Pass Filter Response

Block Diagram

Schematic

A. DESCRIPTION

The Type 1340, 10.7 MHz Plug-in Unit is designed for use with the Model 340 Transistor Noise Analyzer to permit rapid measurement of transistor noise figures at 10.7 MHz. The instrument is self-calibrating for base resistances of 50, 100, 200, 500, 1K and 2K ohms.

B. SPECIFICATIONS *

NOISE FIGURE:	Measured directly in db in two meter ranges, 0 - 20db and 20 - 40db, for base resistances of 50, 100, 200, 500, 1K and 2K ohms.
COLLECTOR VOLTAGE:	Adjustable 1v to 60v with either polarity. Full scale meter ranges of 3, 10, 30 and 60 volts.
COLLECTOR CURRENT:	Adjustable from .01 to 30 milliamperes. Full scale meter ranges of .03, 0.1, 0.3, 1, 3, 10 and 30 milliamperes.

* When used with the Model 340 Transistor Noise Analyzer

SIZE: 9"w x 5½"h x 11"d

WEIGHT: 7½ lbs.

A. OPERATION

1. Plug the Type 1340 head into the Model 340 front panel and tighten the two locking thumb screws provided.

2. Select the desired base resistance by means of the BASE RESISTANCE switch. Set the desired operating conditions and transistor type on the Model 340 (see manual).

3. Insert transistor in front panel socket and close shield cover, activating base and collector interlock switches. If the higher base resistances are selected, tune the CAPACITY control on test jig panel for maximum noise figure and minimum AGC meter indication. For the lower value of base resistances, the setting of the CAPACITY control is unimportant.

4. No further adjustment of the Type 1340 is required. Noise figure is indicated directly in db on the Model 340

A. GENERAL

1. The Type 1340 10.7 MHz Plug-in Unit is basically the RF section of a single conversion superhetrodyne receiver, having its own calibrating and mixing signals necessary to convert the noise and calibrating signals from 10.7 MHz to the frequency spectrum of 0 to 50 KHz. Here the necessary signals are separated and displayed by the Model 340 analyzer.

2. All power and control signals are supplied by the Model 340. The Block Diagram and Schematic Drawing show the basic connections and will enable the reader to follow the individual circuit descriptions.

B. TEST TRANSISTOR CIRCUITRY

1. To enable the direct reading of transistor noise figure, the total noise output must be referenced to the thermal noise of the transistor source resistance. The reference is done by maintaining a constant amplifier gain, independent of the operating parameters of the transistor under test. Constant gain is accomplished by inducing a fixed known calibrate signal in the emitter of the transistor under test. The level of the 10.720 MHz calibrate signal is changed for each value of resistance selected by the BASE RESISTANCE switch S1A to maintain an overall amplifier gain inversely proportional to the thermal noise of the base resistance selected.

2. L1 and C2 are used to tune out the reactive component of the base circuitry and present a low impedance path for the base bias current.

3. The test transistor collector connects to a broadband current transformer T2 which serves to supply a low impedance path for the DC collector current, the AC noise and the calibrate signal to the first 10.7 MHz amplifier.

4. Interlock switches S2A and S2B and discharge paths R1 and R9 are provided to remove operating potentials from both base and collector of the test transistor when the hinged shield cover is opened.

C. 10.7 MHz AMPLIFIERS

1. The operating level of Q1, the first amplifier, is selected for optimum noise figure. It is operated in a grounded base configuration to provide maximum isolation and a low input impedance for the test transistor collector. R12 determines the current in Q1. T3 and C5 tune the collector to 10.7 MHz and supply an amplified noise and signal current to the next amplifier. C6 is a DC blocking capacitor and C4 a collector return bypass capacitor. Bandwidth of the collector transformer is -3db between 400 and 500 KHz, being determined within these limits by the level of the current in the automatic gain control (AGC) circuit (R13, R14, CR1). The overall -3db bandwidth for the six amplifier stages is approximately 150 to 200 KHz. In order to maintain system noise at a minimum for low Cm conditions of the test transistor, the AGC current to the first stage is ineffective until the AGC voltage exceeds approximately 5 volts. As the test transistor Gm increases, AGC control current increases through CR4, CR2, R15, CR1, R13 and T3 to ground. The DC current lowers the AC impedance of CR1 and shunts some of the noise and signal current to ground, resulting in reduced amplifier gain.

2. The following amplifier sections operate in a similar manner with the exception of the 5th and 6th amplifiers which operate at fixed gain levels.

D. 10.720 MHz CALIBRATE SIGNAL

1. The calibrate signal is generated by Q8 operating grounded base. Transistor current is limited by emitter resistor R48. The quartz crystal Y1 operates in a series resonant mode and derives feedback current from the collector tank circuit C36 and T9. A second output winding on T9 drives the emitter of buffer amplifier Q9. Q9 is supplied with sufficient drive to operate class "C". T10 output is directly proportional to Q9 collector supply voltage. Collector voltage for Q9 is supplied from the voltage divider R56 through R63 as selected by the BASE RESISTANCE switch S2B. The ratios of the dividers are adjusted to supply a calibrate signal level proportional to the thermal noise voltage of the test transistor base resistances. The calibrate signal from T10 is further attenuated by the shielded variable attenuator module R53, R54 and R55. Attenuator output drives the shielded 100:1 ratio calibration signal transformer T1 located in the emitter of the test transistor. The signal level from T1 is directly related to the BASE RESISTANCE switch and varies from 17 microvolts for the 50 ohm position to 170 microvolts for the blank 5000 ohm position.

E. 10.700 MHz LOCAL OSCILLATOR SIGNAL

1. The local oscillator signal is generated by Q10 operating grounded base. Transistor current is limited by emitter resistor R66. The quartz crystal Y2 operates in a series resonant mode and derives feedback current from the collector tank circuit C49 and T11. A second output winding on T11 drives the emitter of buffer/amplifier Q11. Q11 is supplied with sufficient drive to operate class "C", the output being determined by the regulated negative 15v power supply. The output winding on T12 drives the emitter of mixer transistor Q7 via the highly selective series resonant circuit L5 and C59.

F. MIXER AND LOW PASS FILTER

1. Q7 operates as a conventional high level mixer, the local oscillator signal injected in the emitter being much larger than the maximum noise and calibrate signal driving the base. The linearity of this mixer is excellent to well above 2 volts RMS output. The converted 20 KHz signal is maintained at a constant 0.25 volt level by the AGC system, providing a large noise overload capability.

2. The collector of Q7 feeds a three pole maximally flat Butterworth low pass filter with cutoff frequency of 50 KHz, thus passing the noise and calibrate signal components below 50 KHz while rejecting all other noise and carrier components above 50 KHz. The output noise and AGC carrier signal go to the Model 340 for separation and metering.

G. NOISE FUNDAMENTALS

The Type 1340 is a frequency converting or mixing system with essentially a zero center frequency IF, therefore noise sidebands on both sides of 10.700 MHz (local oscillator frequency) are converted to a folded or superimposed spectrum extending from zero frequency to the cutoff frequency of the low pass filter. As the noise bandwidth of the RF amplifier is very wide (approximately 175 KHz), allowing both sidebands to be converted, the effective noise per Hz of bandwidth below 50 KHz will be 3db greater due to the second sideband, than an equivalent bandwidth at 10.7 MHz before converting. However, only one sideband of the calibrate signal is used, i.e. the difference frequency of the two crystals 10.720 MHz - 10.700 MHz. The result is a noise to calibrate signal ratio from the mixer 3db greater than the noise to calibrate signal ratio for the same bandwidth at the test transistor input. The above facts must be realized if attempts are made to calibrate by the known gain known bandwidth approach.

MAINTENANCE AND CALIBRATION

A. GENERAL

1. The design of the Type 1340 is straightforward, employing rigorously screened long life semiconductors. Preventive maintenance is not required. Trouble shooting, if required, may readily be done in sections as indicated in the block diagram and schematic diagram. Standard transistor servicing care should be used throughout.

2. The components and transistors in the Type 1340 are conservatively rated and should provide long and trouble free service. Circuits are designed to minimize effects of any changes in semiconductor parameters.

3. Do not change any adjustments without a thorough knowledge of the circuit and function of the adjustment.

4. Transistors can be easily damaged with large transient voltages, therefore, take great care not to short any terminals or conductors when making measurements on the printed circuit boards. In soldering to the boards, have the iron only hot enough to make a rapid clean solder joint. DO NOT use a solder gun and DO NOT apply any force which would tend to push the copper away from the board.

B. ACCESSIBILITY OF ADJUSTMENTS

1. All adjustments are accessible by removing the top and bottom shield covers as follows:

   a. Remove the four #4 binder head screws from the top cover and the upper two #4 binder head screws on each side. Gently remove cover. This gives access to all adjustments except C59, the mixer local oscillator series resonant coupling adjustment, which is accessible by removal of the bottom cover.

   b. Remove the two lower #4 binder head screws from each side, turn the unit upside down, remove the four #4 flat head screws from the bottom cover and remove cover. Note that flat head screws are required in the bottom cover and that the bottom cover is countersunk to receive them.

C. CALIBRATION

1. Before making any adjustments, the Type 1340 must be supplied with power either from the Model 340 by means of an extension cable, or by separate ± 15 volt supplies. The AGC control line (pin 3 P1) may be manually controlled by connecting to the center arm of a potentiometer connected across the + 15 volt supply (a 5K, 10 turn, 5 watt potentiometer is ideal).

THIS IS A MUST!

2. 10.720 MHz calibrating signal

a. Remove the six #4 binding head screws holding the oscillator shield and remove the shield. Using a low capacitance probe and high frequency oscilloscope, check the signal at terminal #5 of the 10.720 MHz voltage controlled buffer/amplifier module. Tune C36, accessible from the top of the calibrate signal oscillator module shield can for maximum output indication. Output waveform should be sinusodial, approximately 3½ to 5 volts peak to peak, and 10.720 MHz within .01%. Connect probe to terminal #2 of the voltage controlled buffer/amplifier module. Tune C42, accessible from the top end of this module shield can, for maximum output. Waveform should be clean, sinusodial and approximately 1.1 volts peak to peak when the BASE RESISTANCE switch S2 is turned fully clockwise. If a sensitive, well shielded RF voltmeter is available, the calibrate level may be adjusted by R55, located at the top of the shielded calibrate signal adjust module, to 170 microvolts at the emitter terminal of the test transistor socket or across the secondary of T1, the shielded calibration transformer.

3. 10.7 MHz AGC amplifier

a. Remove the 10.720 MHz crystal and replace it with the 10.700 MHz crystal. Do not change any calibrate signal adjustments. Place a small 6800 ohm carbon resistor between the emitter and collector pins of the test transistor socket. If power is being supplied from the Model 340, turn the collector voltage control to zero. Connect a low capacitance oscilloscope probe to terminal #2 of the 6th, 10.7 MHz amplifier. Adjust the potentiometer used to supply AGC bias, to obtain approximately a 1 volt peak to peak indication with the BASE RESISTANCE switch full clockwise. The calibrate signal should be symmetrical with some random noise signals superimposed on it. Align all AGC amplifier trimmers C5, C10, C14, C18, C22 and C26 for maximum calibrate signal amplitude.

4. 10,700 MHz local oscillator

a. Insert the 10.700 MHz crystal in the local oscillator(NORMAL SOCKET
10.70 = Y2
10.72 = Y1
crystal socket and the 10.720 MHz crystal in the remaining socket. Using a low capacitance oscilloscope probe, observe waveform at terminal #5 of the local oscillator buffer/amplifier module and adjust C49 for maximum amplitude, approximately 3½ - 5 volts peak to peak should be available. Move probe to terminal 2 of the local oscil-

NOTE

ON SERIAL # 102 USED WITH SER # 101 MODEL 340

STEP #5 READINGS WERE TOO HIGH.

THIS CONDITION WAS CAUSED BY EXCESSIVE RIPPLE ON -15V

POWER SUPPLY (BOARD # 5322 IN 340 MAIN FRAME)

A 100 uF @ 25V CAP WAS PLACED FROM PIN 13 ON J101

TO GROUND. PRE AMP THEN CALIBRATED OK 11-14-68.

XRR

lator buffer/amplifier module and adjust C55 for maximum signal. Connect probe to terminal #5 of the converter or mixer module. Replace the shield covering the oscillator terminal sections, being careful of cables and wiring. Tune C59, accessible through the hole in this shield for a maximum oscilloscope indication. If the frequency response of the oscilloscope is high enough, distortion of the positive wave halves will be observed. The distortion is normal.

5. Frequency converter or mixer

NOTE

WAVE ANLZ

a. With both crystals Y1 and Y2 in their proper sockets, place a small 1000 ohm carbon resistor between emitter and collector of the test transistor socket. If power is being supplied from the Model 340 turn the collector voltage control to zero. A wave analyzer connected to the noise output pin #1 of P1 should indicate a calibrate signal between 19 and 21 KHz. Adjust AGC level to obtain 0.25 RMS volt amplitude at pin #1 P1. Adjust 2nd, 4th and 6th AGC amplifier trimmers C10, C18 and C26 for maximum amplitude. Place BASE RESISTANCE switch to extreme clockwise position and readjust AGC level to obtain 0.10 volt 20 KHz signal at converter output, pin #1, P1. Switch BASE RESISTANCE to 50 ohm position. The 20 KHz calibrate signal should drop to 0.01 volt; if not, adjust R62. Switch the BASE RESISTANCE switch progressively to 100 ohm, 200 ohm, 500 ohm, 1K and 2K positions. The 20 KHz calibrate signal should indicate 0.014, 0.020, 0.0316, 0.0446 and 0.0631 volts respectively; if not, adjust in sequence R61, R60, R59, R58 and R57.

FULL CLOCKWISE — TO .10V
50Ω — .01V — R-62
100Ω — .014V — R-61
200Ω — .020V — R-60
500Ω — .031LV — R-59
1K Ω — .0446V — R-58
2K Ω — .0631V — R-57
MAX — .100V — FIRST

.0631

b. Calibration level

Alternate methods of determining the calibrate signal level are as follows: (see also Section 4, C.2.)

a. Connect an accurate signal generator in series with a small 1000 ohm carbon resistor between the collector terminal of the test transistor socket and ground. Remove the 10.720 MHz crystal and adjust the signal generator to 10.720 MHz and 170 microvolts output. Adjust the manual AGC control for 0.25v RMS 20 KHz signal at converter output pin #1, P1. Remove signal generator and place the 1000 ohm resistor between collector and emitter terminals of the test transistor socket. Set BASE RESISTANCE switch fully clockwise, insert 10.720 MHz crystal and adjust calibrate level adjust R55 to obtain 0.25v RMS 20 KHz signal at converter output pin #1, P1.

19.98

b. The following method requires the Type 1340 to be connected to the Model 340 directly or by extension cable and requires an accurate random noise generator at 10.7 MHz. Insert a low noise figure transistor in the test jig socket, set operating parameters for minimum noise with BASE RESISTANCE in 50 ohm position. Connect the noise generator between base of the test transistor and ground and set for a noise level of 9.1×10^{-9} volts in one Hz of bandwidth across the 50 ohm base resistor. Set calibrate signal level adjust R55 for a noise figure indication on the Model 340 of 20 db.

Note: It is necessary that the noise generator be DC isolated from the transistor base to allow normal bias voltages for the test transistor. Note that the Model 340 be previously calibrated.

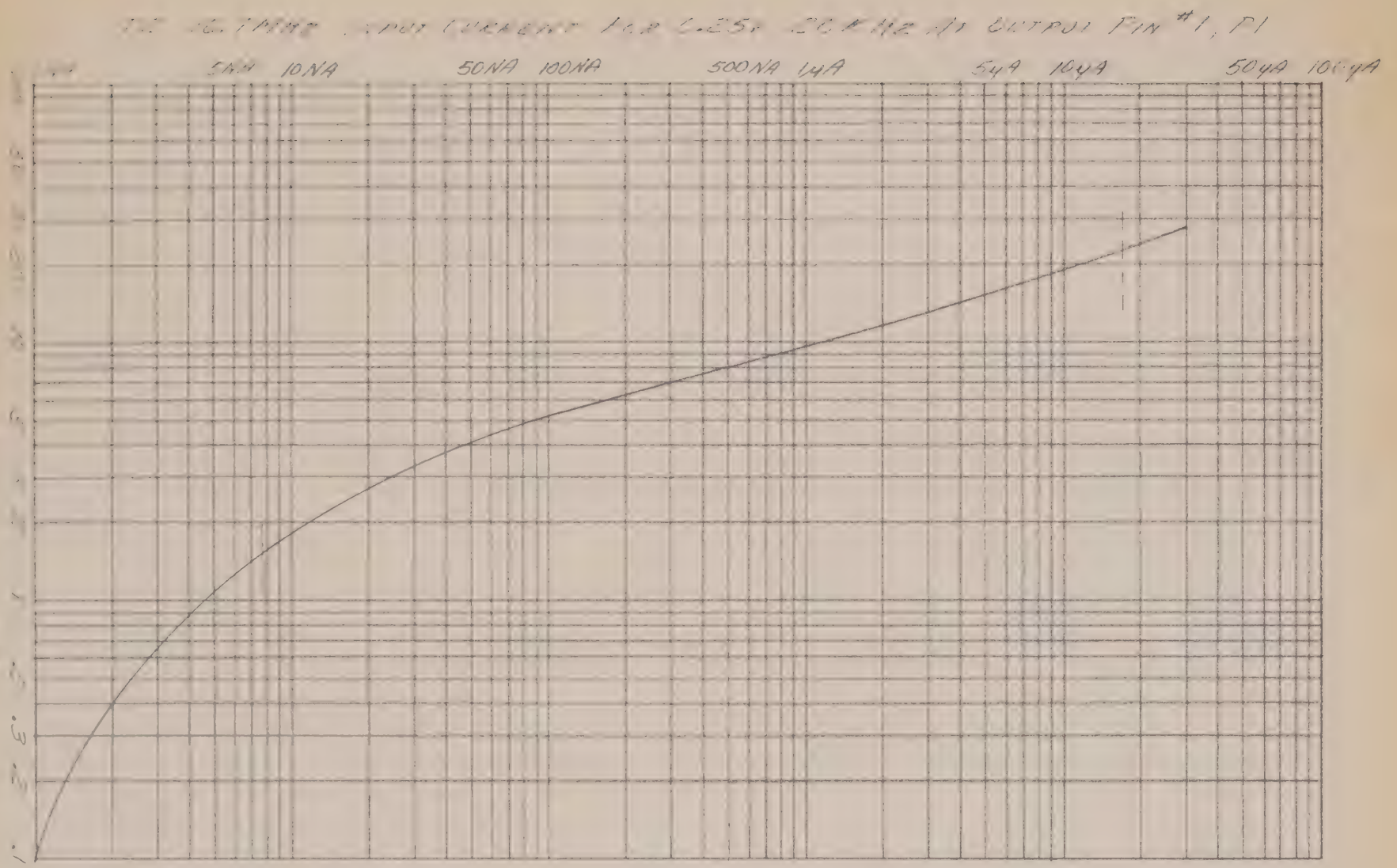
1. BOARD #4096 Assy #5329

— 100K 1% (gray cec) Resistor from Pin #9 of [illegible] - REMOVE.

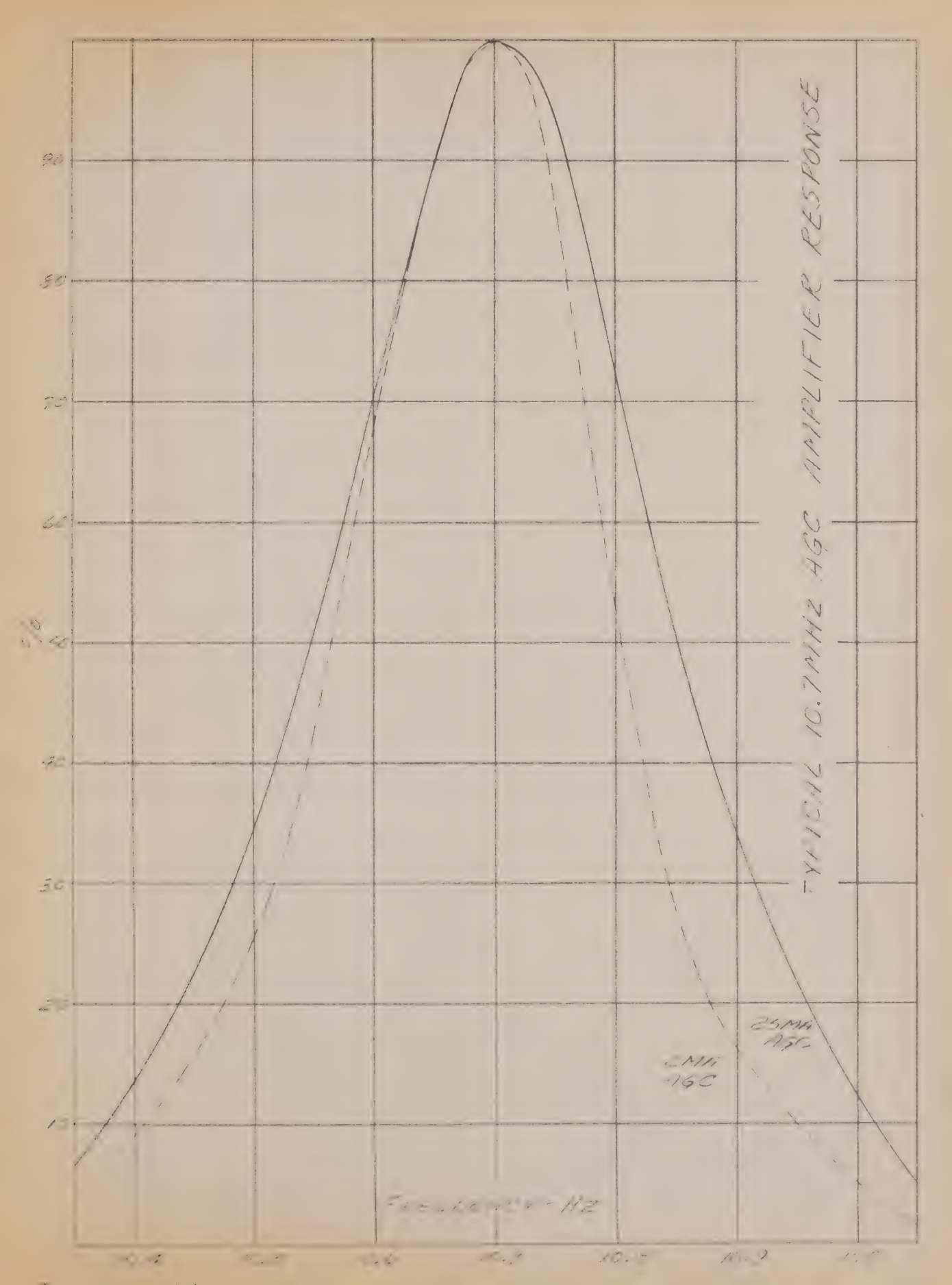
to MAKE INTERNAL meter face [illegible]

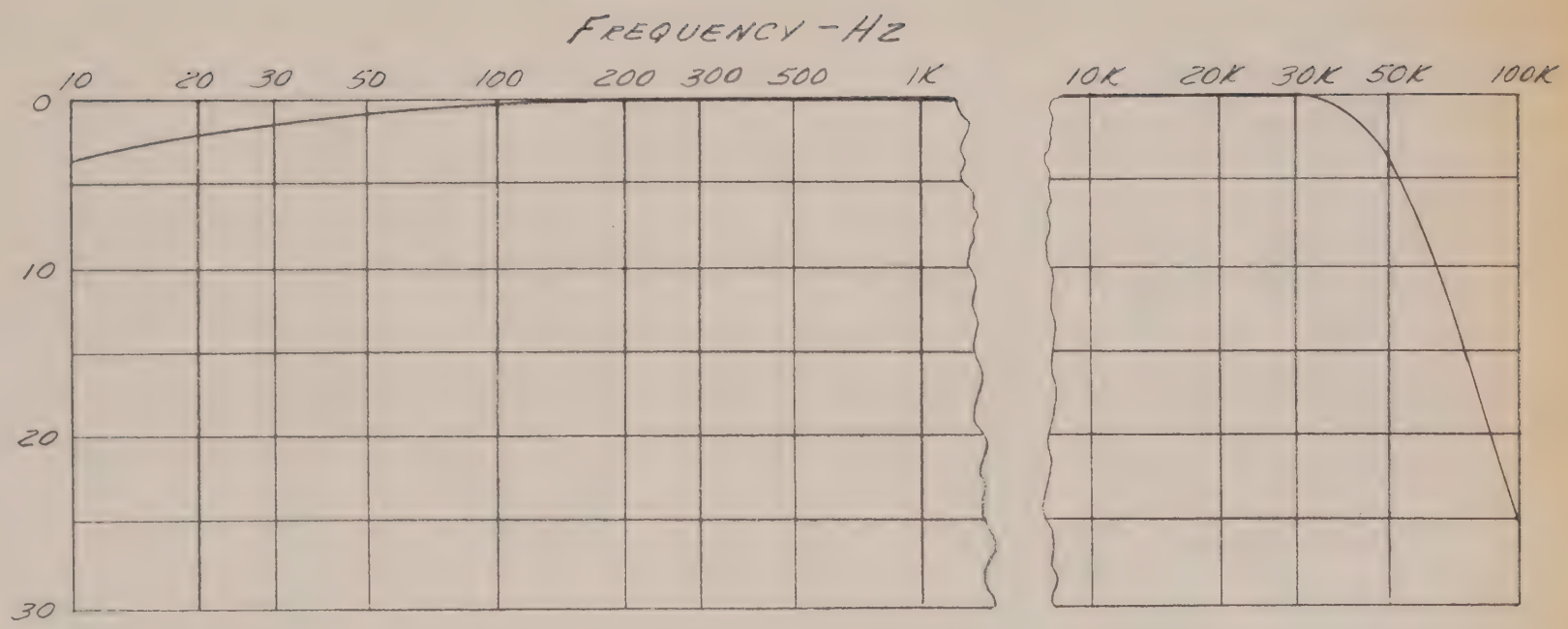
2. MAX. GATE BIAS VOLTAGE AVAILABLE ≥ 14. VOLTS

05-05-66

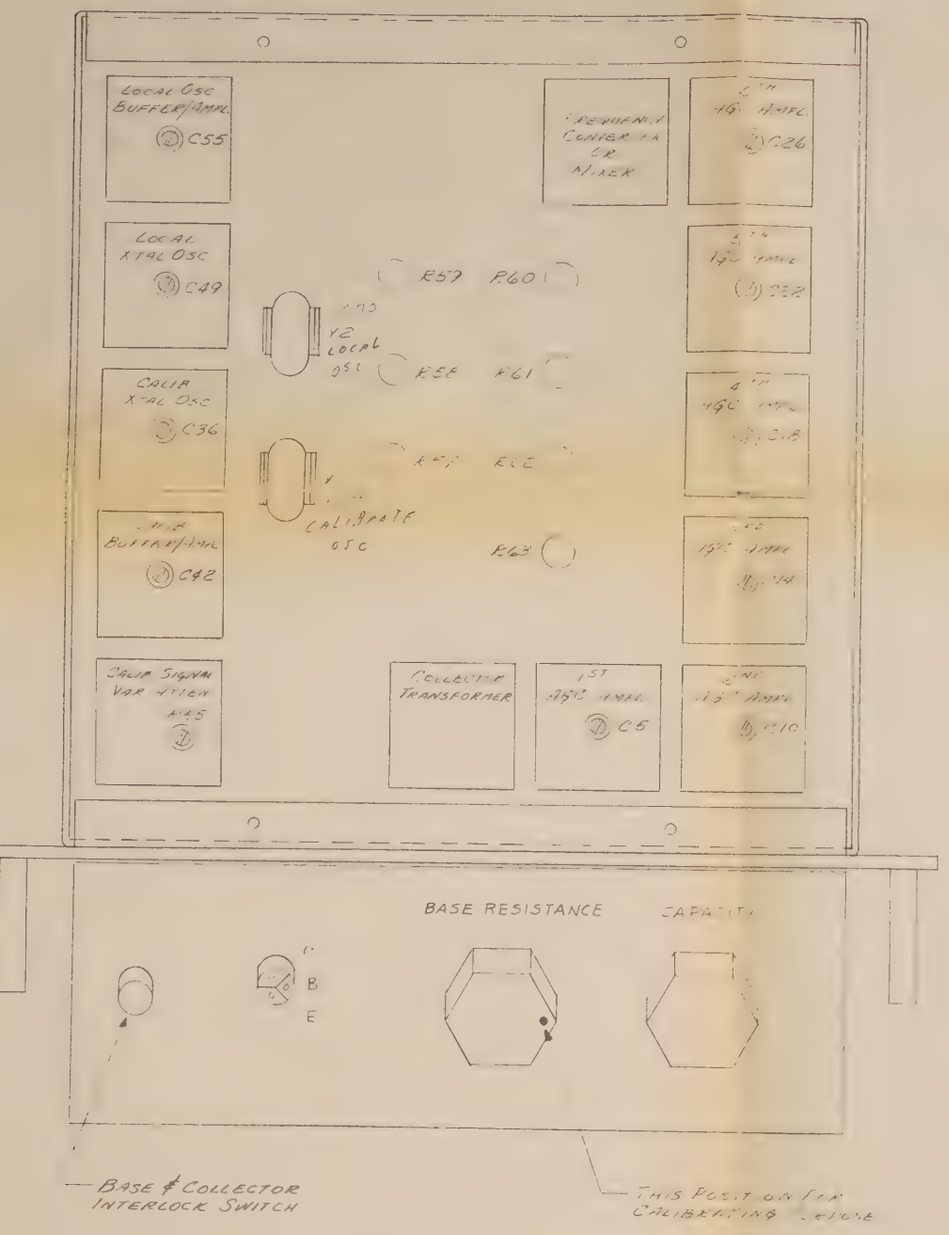


TYPICAL AGC GAIN PLOT

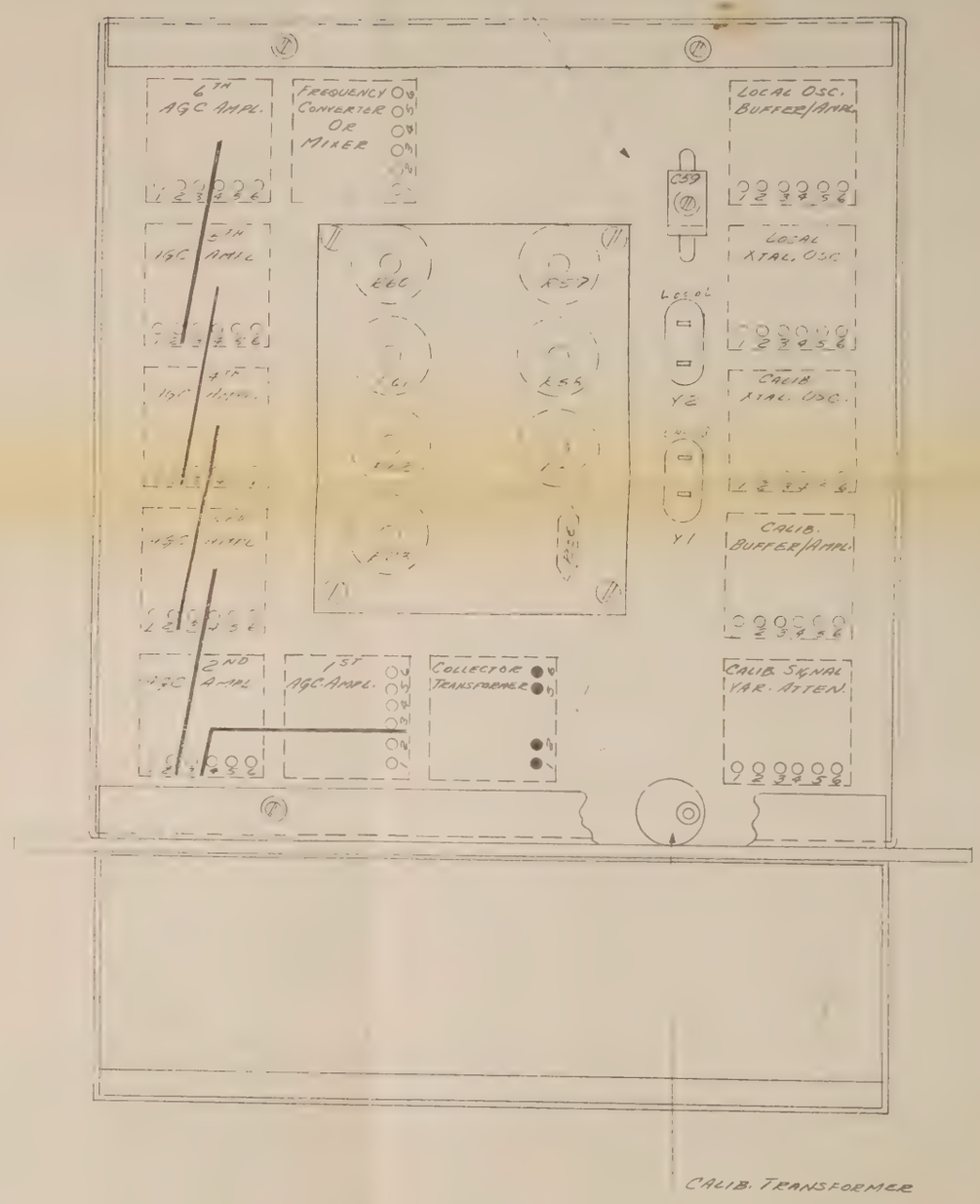

TYPICAL 10.7 MHz AGC AMPLIFIER RESPONSE
25 MA AGC
2 MA AGC
FREQUENCY - MHz



TYPICAL LOW PASS FILTER RESPONSE



A. TOP VIEW
TOP COVER REMOVED



B. BOTTOM VIEW
BOTTOM COVER REMOVED

LOCATION AND IDENTIFICATION OF ADJUSTMENTS TYPE 1340 1.0 MHz & 10.7 MHz

SEMICONDUCTOR LEGEND

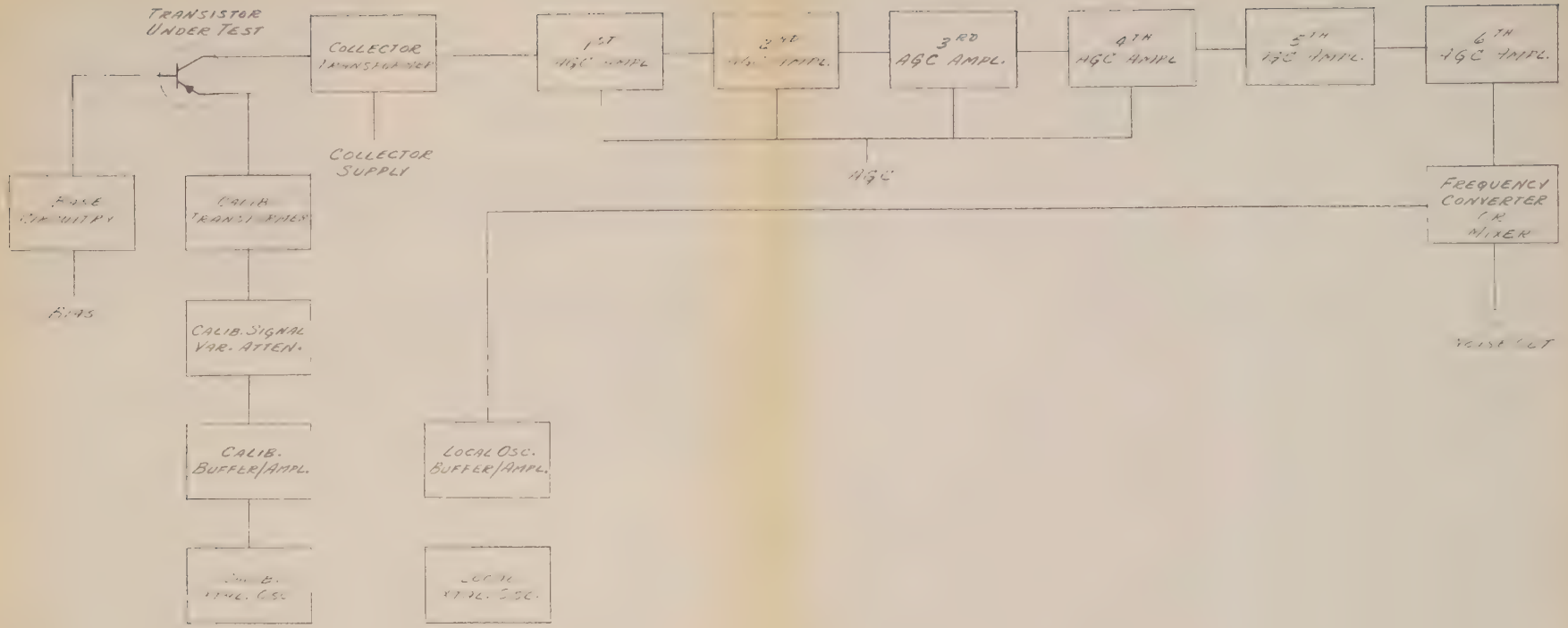
Changes and improvements in the semiconductor products available for commercial use necessitate type changes from time to time. To eliminate confusion and costly paperwork, many of these changes will be covered in the following legend. The purpose of this legend is to acknowledge the fact that the type number on a semiconductor found in a piece of equipment will not necessarily correspond with the type number given on the schematic diagram.

The legend is not intended to be an interchangeability list although in many cases good quality components* within a given category may be substituted with acceptable results. Normally, replacements should be made using components having the same type number as the component being replaced.

Those components bearing an asterisk on the schematic diagram are factory selected components and should be obtained from Quan-Tech Laboratories.

*It should be noted that the incoming inspection procedure followed at Quan-Tech Laboratories includes noise screening on most semiconductors.

TYPE # ON SCHEMATIC	TYPE # IN EQUIPMENT
2N414	2N396A, 4JX1G759, 4JX1D653
2N396A	4JX1G759, 4JX1D653
T1480	2N1613
T1494	2N1613
2N2603	2N3250
2N929	220N2
2N2219	220N2



BLOCK DIAGRAM
PLUG-IN UNIT
TYPE 1340
1.0 MHz AND 10.7 MHz

B-5352-A

Short Form Catalog

INSTRUMENTS • AMPLIFIERS • NOISE INSTRUMENTATION

Quan-Tech®

GENERAL INSTRUMENTS

• ELECTRONIC INSTRUMENTS • ANALYZERS • AMPLIFIERS • SPECIAL INSTRUMENTS •

WAVE ANALYZERS

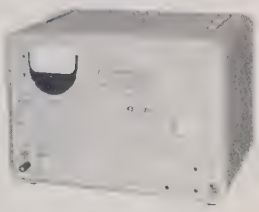
MODEL 303
WAVE AND NOISE SPECTRUM ANALYZER

Frequency range: 30 cps to 100 Kc. **Bandpasses:** 10, 30, 100, 1000 cps, selectable at front panel. (100 and 1000 cps bandwidths flat-topped for simplified noise computation, greater accuracy and convenient tuning. **Sensitivity:** 100 μv to 300 v, FS. Down to 1 μv FS with accessory Model 203 preamplifier (see below). ±300 cps vernier; selection of long or short meter time constants; metering circuits compensated to minimize error from instantaneous noise pulses; overload-protected meter; analog output for external monitoring. **Price:** $1475

MODEL 2156 WAVE AND SPECTRUM ANALYZER

Similar to above except: **Frequency range:** 10 cps to 30 Kc. **Bandpasses:** 3, 10, 30, 300 cps. **Price** $1950

MODEL 304
LOW FREQUENCY WAVE & SPECTRUM ANALYZER



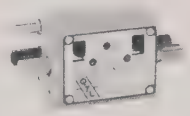
Frequency range: 1 cps to 5 Kc; **Bandpasses:** 1, 10 & 100 cps, selectable at front panel; **Skirt Selectivity:** 24 DB per 1/2 bandwidth; **Voltage range:** 30 μV to 100 v, FS; down to 3 μV FS with accessory Model 201B preamplifier (see below); **Tuning:** Manual or automatic; Internally supplied electronic sweep of total frequency range or of any portion; provision for external sweep; **Frequency Calibration:** Linear; **Outputs:** BFO, sample of automatic sweep, analogs of meter readings and frequency setting, phase output for phase plot on X-Y recorder. **Price:** $2350

OPTIONAL FEATURES

Pen lift; AFC; Log, squared, or RMS meter reading; slave operation for multi-channel analyzer system. Prices: Upon request.

SOLID STATE AMPLIFIERS

MODEL 201B
DC DECADE AMPLIFIER
AC OR DC COUPLED



Bandwidth: DC or 10 cps to 3Mc (3db); **Gain:** 10 (fixed); Power: Self-contained batteries; 600 hour life. **Price:** $110

MODEL 203
LOW NOISE AC AMPLIFIER

Bandwidth: 30 cps to 100 Kc (+0.5 db); —3 db at 500 Kc; **Gain:** 100 (fixed); **Typical noise:** 5×10^{-9} v and 3×10^{-12} a per root cycle at 1 Kc. Battery powered; **Price:** $125

MODEL 205
HIGH-STABILITY DC AMPLIFIER

Bandwidth: dc to 100 Kc (0.5 db down); 3 db down at approx. 500 Kc; **Gain:** 10 (fixed); **Typical drift:** less than 250 μv at constant ambient, input shorted. External + & — 12 v required. **Price:** $105

MODEL 206
SELECTABLE GAIN AC AMPLIFIER

Bandwidth: 10 cps to 100 kc (within 0.5db); —3db at 500 Kc. **Typical noise:** 5×10^{-9} v and 3×10^{-12} a per root cycle at 1 Kc. **Gain:** 10, 100 & 1000, selectable at front panel; **Power:** 105-125 v AC or optional self-contained battery pack (automatically recharging). **Price:** $165, Batteries $25.

MODELS 2182 AND 2220
AC INSTRUMENTATION AMPLIFIERS

Modular rack mounted amplifiers having controlled gain vs frequency characteristics. **Max voltage gain:** 10,000. **Attenuation:** 0-75 db in 5 db steps. **Frequency characteristics:** (selected by plug-in cards) voltage gain flat 10 cps to 100 Kc or 10 cps to 20 Kc, rising 3 db/octave 10 cps to 100 Kc or 6 db/octave 10 cps to 20 Kc. **Power:** 105-125 VAC.

MODEL 2182 (shown) mounts four units in a 7" x 19" rack panel. **Price** $455.

MODEL 2220 (not metered) mounts eight units in 7" x 19" rack panel. **Price** $590.

SPECIAL INSTRUMENTS

Quan-Tech manufactures a great many "specials", ranging from one unit only to production quantities on an OEM basis. Our engineering department is extremely flexible and equipped to handle anything from minor modifications of standard instruments to the design and construction of an extremely complicated fully automatic noise measuring system. We are proud of our ability to meet difficult specifications that challenge the state of the art for low noise, stability, and accuracy. Your inquiry will receive a prompt reply.

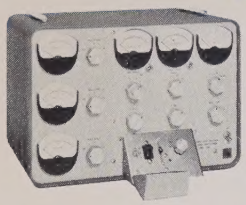
All prices shown are F.O.B. Whippany, N. J. Prices and specifications subject to change without notice.

Quan-Tech LABORATORIES, INC.

43 SO. JEFFERSON ROAD, WHIPPANY, NEW JERSEY - 07981 • PHONE (201) 887-5508

Quan-Tech®

NOISE INSTRUMENTS



MODEL 310 TRANSISTOR NOISE ANALYZER

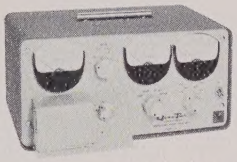
Measures noise current and voltage at 100 cps, 1 Kc and 10 Kc, as well as I_{cbo}, I_{ebo} and beta. **Noise voltage range:** 0.01 to 3 μV/root cycle, FS. **Noise current range:** 1 to 300 pa/root cycle, FS. **Collector current range:** 0.05 to 30 ma. **Collector voltage range:** 0.1 to 30 v. **Base resistance range:** 0, 500, 1K, 10K plus external position. **Price:** $2375

MODEL 311 TRANSISTOR NOISE ANALYZER

Similar to above, except that collector current range is from 5 to 1000 μa for noise measurement in low-collector-current devices. Measures Gm instead of beta. Also measures FET's. **Price:** $2575

MODEL 312 TRANSISTOR NOISE ANALYZER

Similar to Model 310, but designed for measurement of field-effect transistors. **Drain voltage range:** 0.1 to 30 v. **Drain current range:** 0.05 to 30 ma. **Gate Bias range:** 1 v forward to 15 v reverse, continuously adjustable. Also measures transconductance. **Price:** $2575.



MODEL 510 TRANSISTOR NOISE ANALYZER

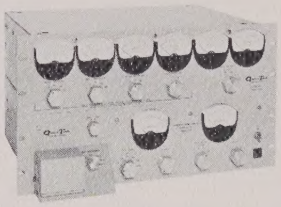
Similar to Model 310 except that it measures noise current and voltage at 1 Kc only. No beta or leakage measurements. **Noise voltage range:** 0.01 to 3 μV/root cycle FS. **Noise current range:** 1 to 300 pa/root cycle FS. **Collector voltage range:** 3 to 30v. **Collector current range:** 0.1 to 10 ma. **Base resistance range:** 0, 500, 1K, 10K ohms plus external position. Also measures FET's. **Price:** $1095.

MODEL 511 TRANSISTOR NOISE ANALYZER

Identical with Model 510 except **Collector current range:** 3 to 300 μa. **Price:** $1145.

MODEL 512 TRANSISTOR NOISE ANALYZER

Similar to Model 510 except that it measures broadband (10 cps to 15.7 Kc) noise figure. **Collector current range:** 10 μa to 1 ma. **Price:** $1145.



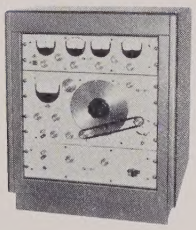
MODEL 2173-2181 TRANSISTOR NOISE ANALYZER

The most versatile unit available. Measures noise current and voltage at 10 and 100 cps, 1, 10, and 100 Kc simultaneously. **Noise voltage range:** 3 to 3000 nanovolts/root cycle FS. **Base resistance range:** 0, 500, 1K, 10K, 100K, and 1M ohms plus external position. **Collector voltage range:** 0.3 to 60 volts. **Collector current range:** 0.3 μa to 30 ma. Also measures FET's. **Price:** $4950.

VERY LOW FREQUENCY NOISE ANALYZER

On special order we can supply a test jig and preamplifier for use with the Model 304 Low Frequency Wave and Spectrum Analyzer for making noise measurements at frequencies down to 1 cps. Write us outlining your requirements.

MODEL 2158 NOISE ANALYSIS SYSTEM



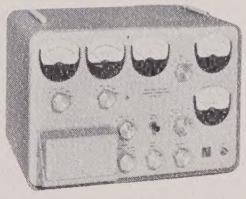
Measures noise in any component or system from 30 cps to 100 Kc. Consists of Model 303 Wave Analyzer with motor driven sweep, two preamplifiers, and two metered power supplies. **Preamplifier gain:** 10, 100, 1K, and 10K. **Input impedance:** 100K + 50 pf or 10 meg + 50 pf. **Typical input noise:** 4 x 10^{-9} V and 2 x 10^{-12} A (100K input), 8 x 10^{-9} V and 6 x 10^{-14} A (10 meg input), per root cycle at 1 Kc. **Power Supplies:** 0.1 to 30 volts and 1 to 450 volts at 100 ma. each. Overload protected. **Ripple:** 1 microvolt max. **Price:** $5200.

MODEL 315 RESISTOR NOISE TEST SET

Measures noise in resistors in conformance with specifications recommended by NBS and Method 308 of MIL STD 202B. **Test-resistor range:** 100Ω to 22 meg Ω. **Measurement range:** 0.6 μv in a decade to 1000 μv in a decade. **Outputs:** Sample of noise voltage; analogs of meter readings. External cable supplied for remote location of test jig. **Price:** $1950

MODEL 2136

Similar to above, but measures resistors down to 10 Ω. **Price:** $2300



MODEL 327 DIODE NOISE ANALYZER

Measures noise in back-biased semi-conductor diodes at 10 cps and 1 Kc simultaneously. **Noise voltage range:** 0.03 μv to 1 mv/cycle of bandwidth. **Test voltage:** 0 to 500v, continuously variable. **Test current:** 0 to 100 ma, continuously variable. Internally supplied ramp automatically sweeps test current and/or voltage within maximum ratings. A wide variety of outputs for data logging, external monitoring, actuating external equipment, etc. **Price:** $2750

TEST JIG AND TRANSFORMER

For measuring noise in forward-biased diodes up to 100 ma. **Price:** $300.

MODEL 317 AMPLITUDE DISTRIBUTION ANALYZER

Determines amplitude - probability distribution of random signals. **Amplifier response:** 3 db down at approx. 12 cps and 1 Mc; **Switching rate:** 5 Mc; **Amplitude ranges:** 100%, 10%, 1% FS; Normal or "inverted" operation; provision for external sweep of level. **Price:** $450

MODEL 420 RANDOM NOISE GENERATOR

Stable "white" noise output having true gaussian amplitude distribution. **Frequency range:** dc to 100 Kc; **Output voltage:** 0.01 to 1000 μv/root cycle, continuously variable, calibrated; **DC offset:** less than 10 mv at max. output. **Price:** $525

MODEL 2184 DIGITAL RESISTOR NOISE TEST SYSTEM

Digitizes, stores, and presents resistor noise data. Consists of Model 2136 Resistor-Noise Test Set plus three digital voltmeters, storage, timing circuits, and optical and punch-card readout. Automatic sequence converts, sums, and stores five total noise readings, five system noise readings, and applied DC voltage. Presents three data channels simultaneously to punch-card system, plus selectable optical readout of any channel. All digital circuitry designed and built by Quan-Tech. **Price:** $9500.

MODEL 2170-71-72 AUTOMATIC RESISTOR NOISE TEST SYSTEM

High-speed automatic sorting of resistors by Noise Index. Sorts 3000/hr. at ± 1 db tolerance, 6000/hr. at ± 3 db tolerance. Higher speeds obtainable by adding additional channels. **Price:** $12,900. (less mechanical handling)

The above systems and modifications of them can be adapted to measuring noise in transistors and diodes. Write us outlining your requirements.

43 SO. JEFFERSON ROAD, WHIPPANY, NEW JERSEY - 07981 • PHONE (201) 887-5508

A Word About Noise Analysis

Since 1957 when it was founded, Quan-Tech Laboratories has specialized in the amplification and measurement of extremely low level signals approaching the theoretical limits of sensitivity. In order to build equipment of this sort it was necessary to select components having the lowest possible electrical noise for use in the most sensitive parts of the circuit. Noisier components were relegated to places where (it was thought) their noise would not interfere with proper operation. These noisy components exhibited a very high rate of failure compared to the quiet ones, so an intensive study of the reasons for these failures was undertaken.

Investigation showed that those components which exhibited excessive amounts of noise (particularly of the "1/f" type) compared to similar units, usually contained some defect or abnormality which could lead to early failure. This was equally true of resistors, transistors, and diodes, even though the failure mechanism might be different for each device.

This discovery led to the development of specific electrical noise measuring instruments for each type of component. Cooperative programs with manufacturers have proved beyond doubt that noise measurements, properly applied, can locate many types of failure-prone components before they are placed in the circuit, with resultant cost saving and increased reliability. Even manufacturers of such fiercely competitive items as automobile radios, electronic organs, and hearing aids have found noise screening cuts costs and improves product quality.

If you haven't already investigated the benefits of noise analysis, both for reliability and for very low noise applications, why not contact us or our local representative and get the full story?

Quan-Tech Sales Representatives

New England

VECTOR SALES, INC.
301 Belmont St.
Belmont, Mass. 02178
617-489-1400

P.O. Box 87
Milford, Conn.
203-TR4-2112

New York,

LINDGREN ASSOCIATES
605 Palmer Drive
North Syracuse, N.Y. 13212
315-GL8-3113

New York City Area, New Jersey, Eastern Pennsylvania

L & M ASSOCIATES
P.O. Box 641
Fair Lawn, N. J. 07411
201-DI3-3070

P.O. Box 4242
Philadelphia, Pa. 19144
215-GE8-5666

Washington, D. C., Maryland, Delaware, Virginia

PADDOCK-JOSLOW COMPANY
P.O. Box 192
Silver Spring, Md. 20907
301-589-6554

Ohio, Michigan, Western Pennsylvania, Kentucky, West Virginia

COMPONENTS ENGINEERING CO.
7461 N. Linden Lane
Cleveland, Ohio 44130
216-842-2737

11820 Knollsprings
Cincinnati, Ohio 45246
513-825-8686

N. & S. Carolina Tennessee, Alabama, Georgia, Florida, Mississippi, Louisiana, Texas (except El Paso) Arkansas, Oklahoma

ROY ATTAWAY CO.
51-53 E. Robinson St.
Orlando, Fla. 32801
305-424-9983
305-424-5328

519 Nissen Bldg.
Winston-Salem, N.C. 27101
919-722-9671

900 Bob Wallace Ave.
Huntsville, Ala. 35801
205-534-2811

7401 Gulf Freeway, Suite 106
Houston, Texas 77017
713-649-7874

Dallas Phone
214-528-9040

Illinois, Indiana, Iowa, Wisconsin, Minnesota, Missouri, Kansas

COZZENS & CUDAHY, INC.
125 Old Orchard Arcade
Skokie, Ill. 60079
312-OR5-6700

925 E. Abert Place
Milwaukee, Wis. 53211
404-ED2-0700

9725 Girard Ave. So.
Minneapolis, Minn. 55431
612-881-2121

6050 Brown Rd.
St. Louis, Mo. 63134
314-521-3034

6142 Prospect Ave.
Kansas City, Mo. 64130
816-444-8595

Washington, Oregon

J. K. DOOLEY CO., INC.
4110 Stone Way N.
Seattle, Washington 98103
206 - ME 2-1618

Northern California

JAY STONE & ASSOCIATES
140 Main St.
Los Altos, Calif. 94022
415-WH8-4563

Southern California, Arizona

A-F SALES ENGINEERING, INC.
94 So. Los Robles Ave.
Pasadena, Calif. 91101
213-MU1-5631
213-SY5-7081

Canada

ATLAS INSTRUMENT CORP.
50 Wingold Ave.
Toronto 19, Ontario
416-RU1-6179

3333 Cavendish Blvd., Suite 390
Montreal, Quebec
514-HU9-8495

342½ Elgin St.
Ottawa, Ontario
613-CE3-9471

909 Beach Avenue
Vancouver, B. C.
604-MU4-7927

All Export (Except Canada)

SYLVAN GINSBURY, LTD.
72 West 45th Street
New York, N. Y. 10036
212-MU7-3213

Quan Tech LABORATORIES, INC.

43 SO. JEFFERSON ROAD, WHIPPANY, NEW JERSEY - 07981 • PHONE (201) 887-5508